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How reliable are Swedish radar data?

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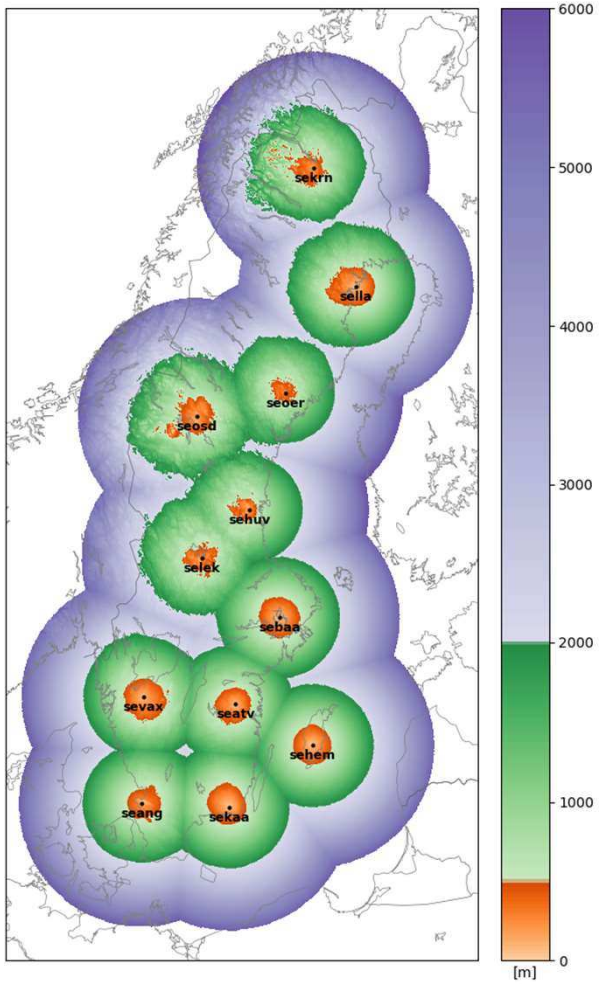
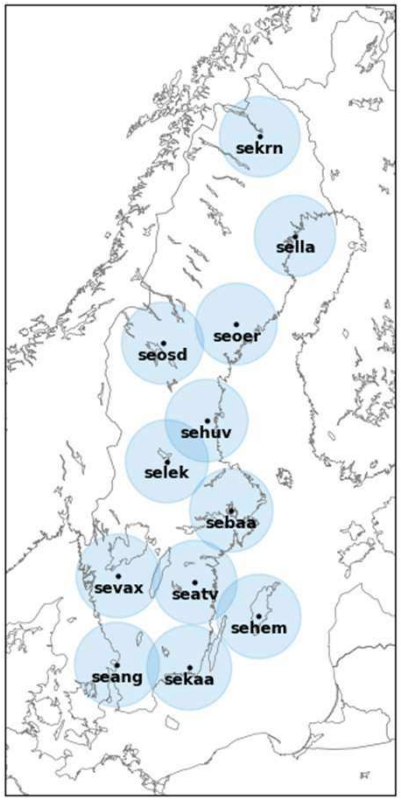
Swedish Meteorological and Hydrological Institute (SMHI)

Network status

- 1 C-band Doppler weather radar (Ericsson)
- 11 C-band dual-pol Doppler weather radars (EEC)
- Upgrade of the radar network to dual-polarization will be finished by the end of 2020.
- Next: Kiruna (August 2020)
- SMHI will take over all weather radars currently owned by the Swedish Armed Forces.



Data flow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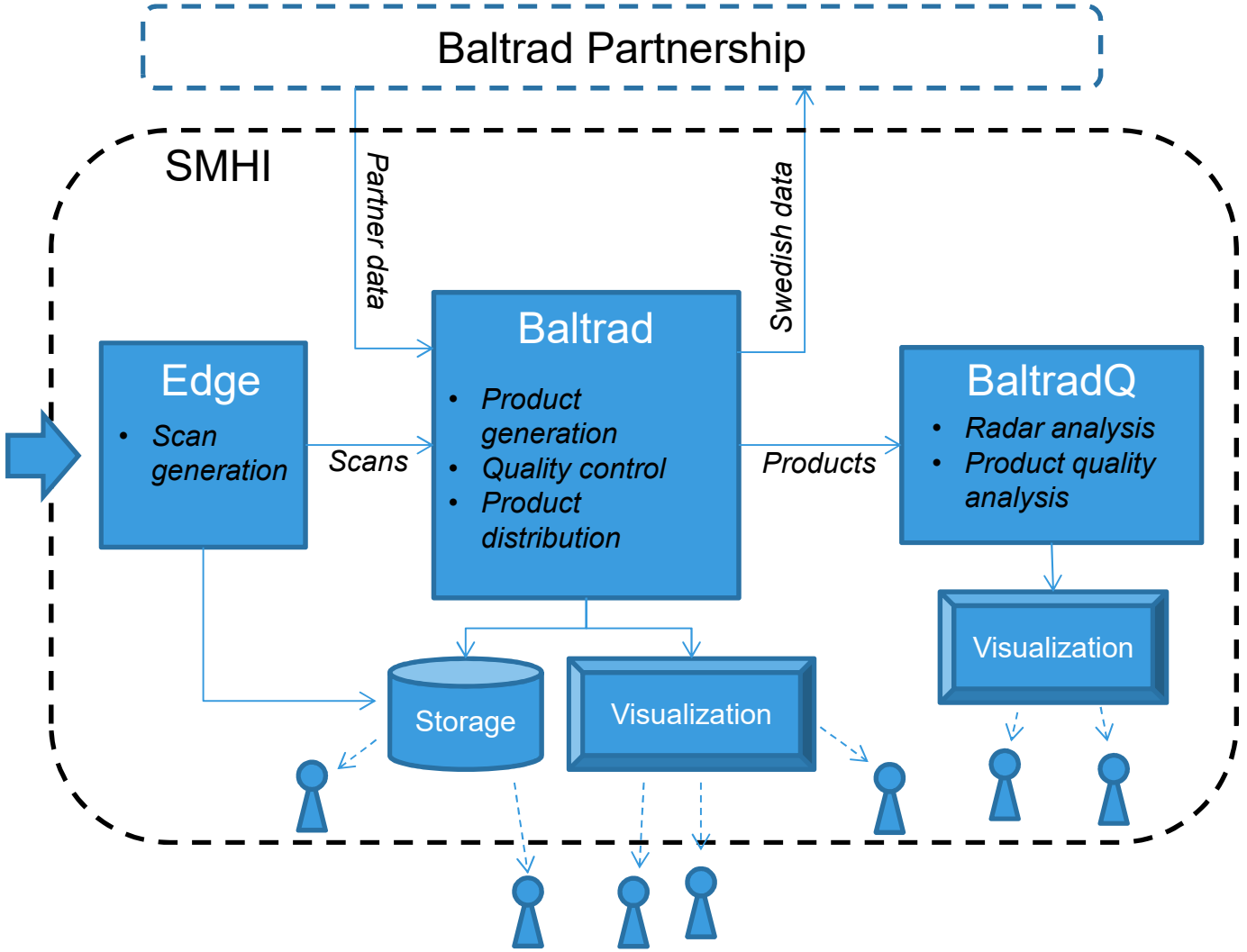
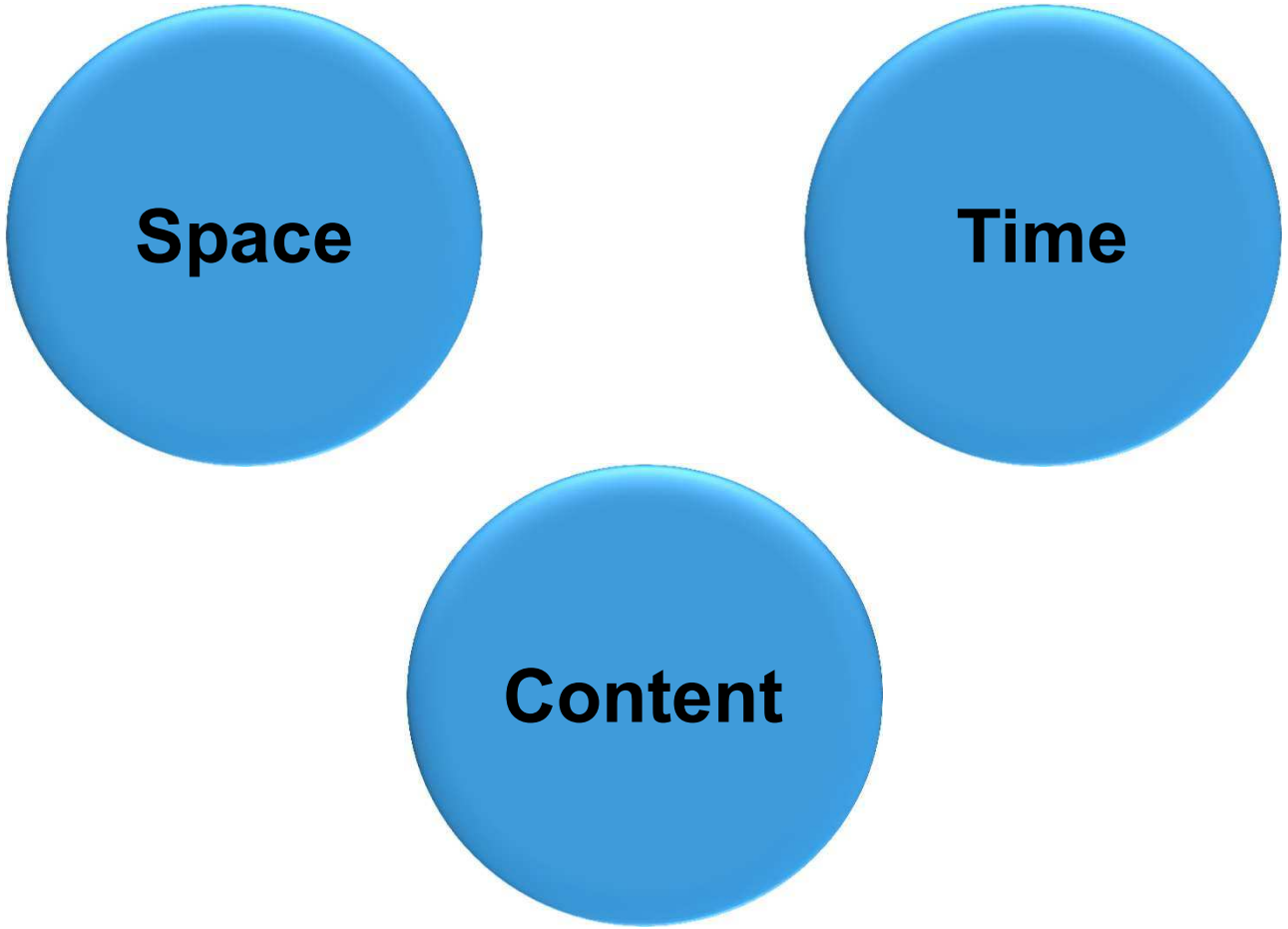
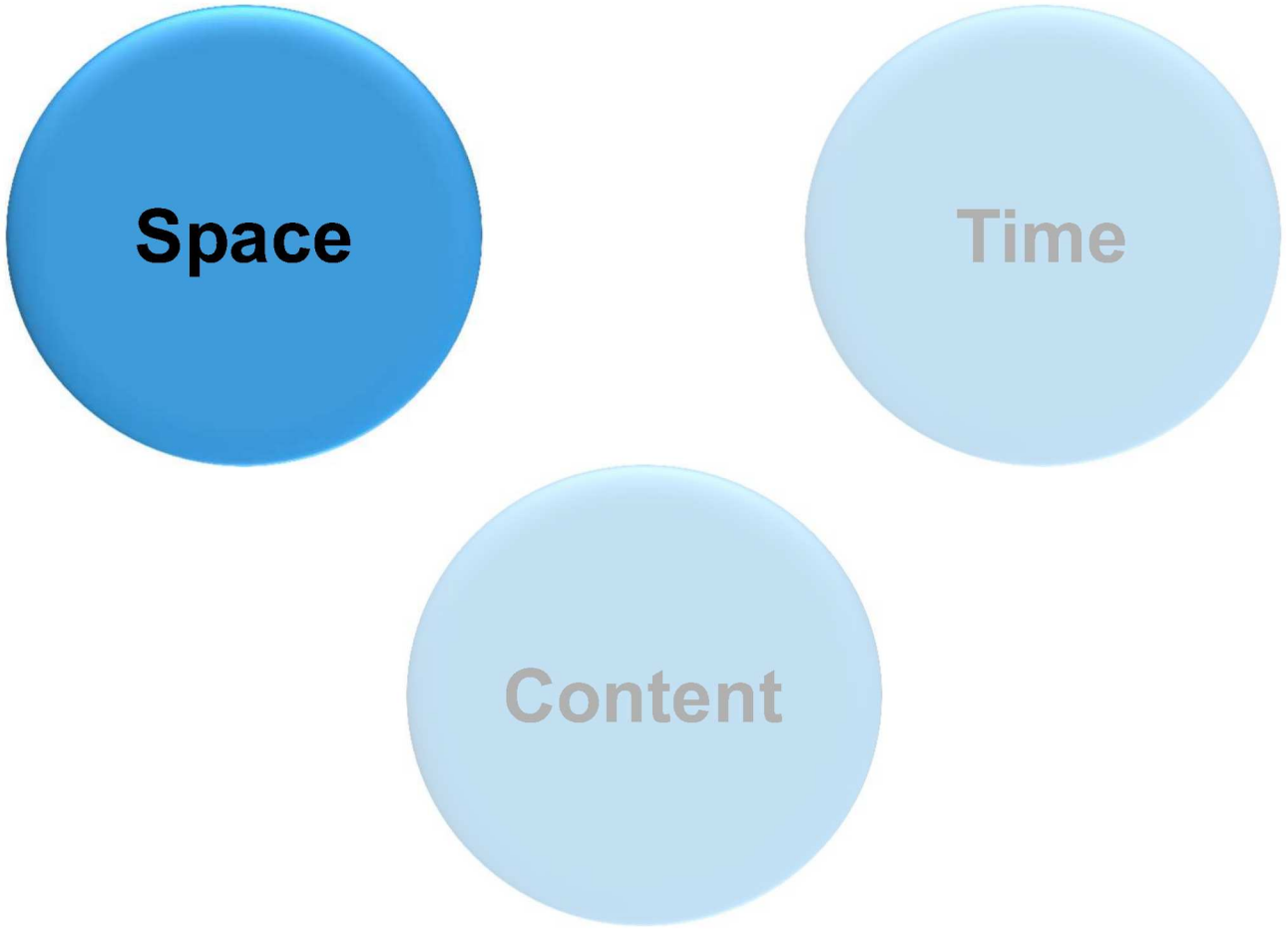

Baltrad Partnership
SMHI
Partner data
Swedish data
Edge
• Scan generation
Scans
Baltrad
• Product generation
• Quality control
• Product distribution
Products
BaltradQ
• Radar analysis
• Product quality analysis
Visualization
Storage
Visualization

Reliability



Reliability



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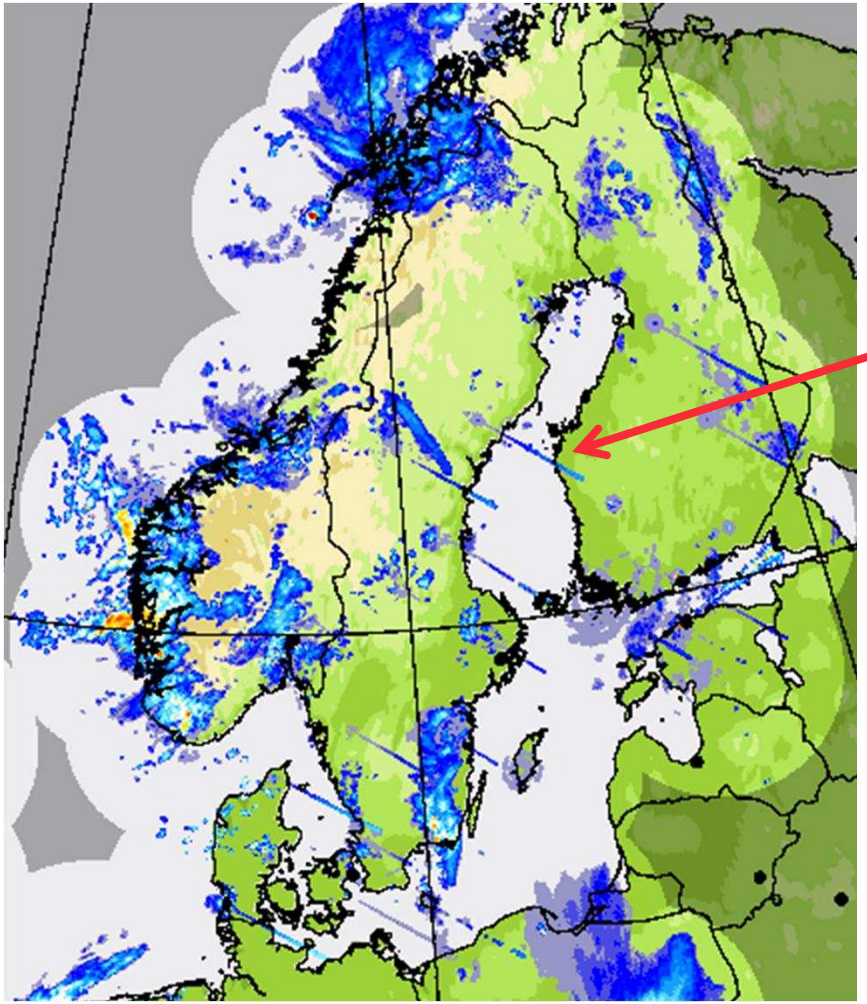
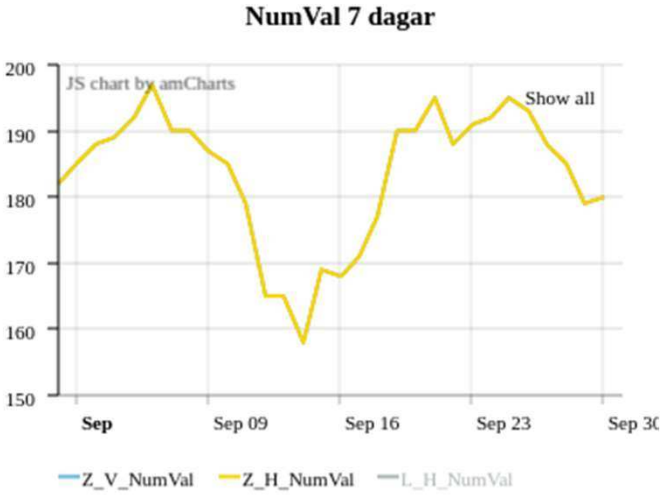
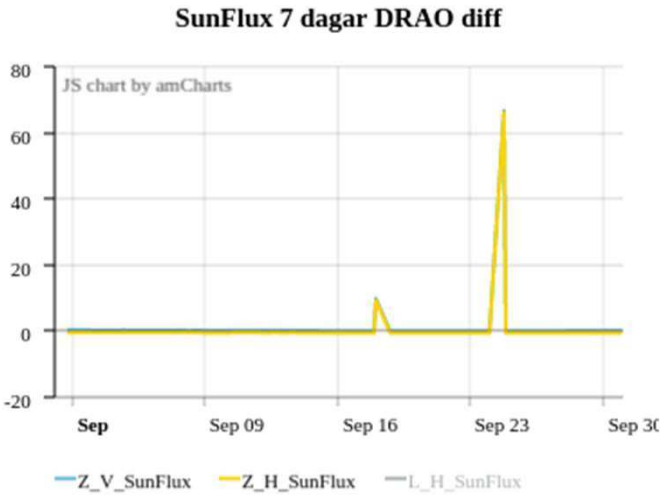
Pointing accuracy using the sun

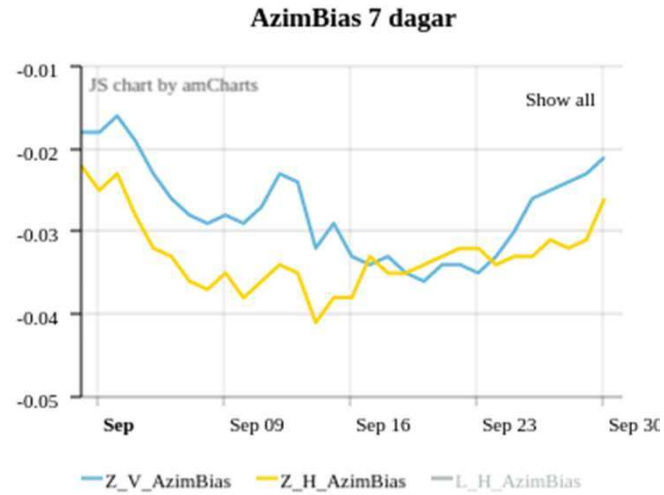


Source: eumetnet.eu/opera

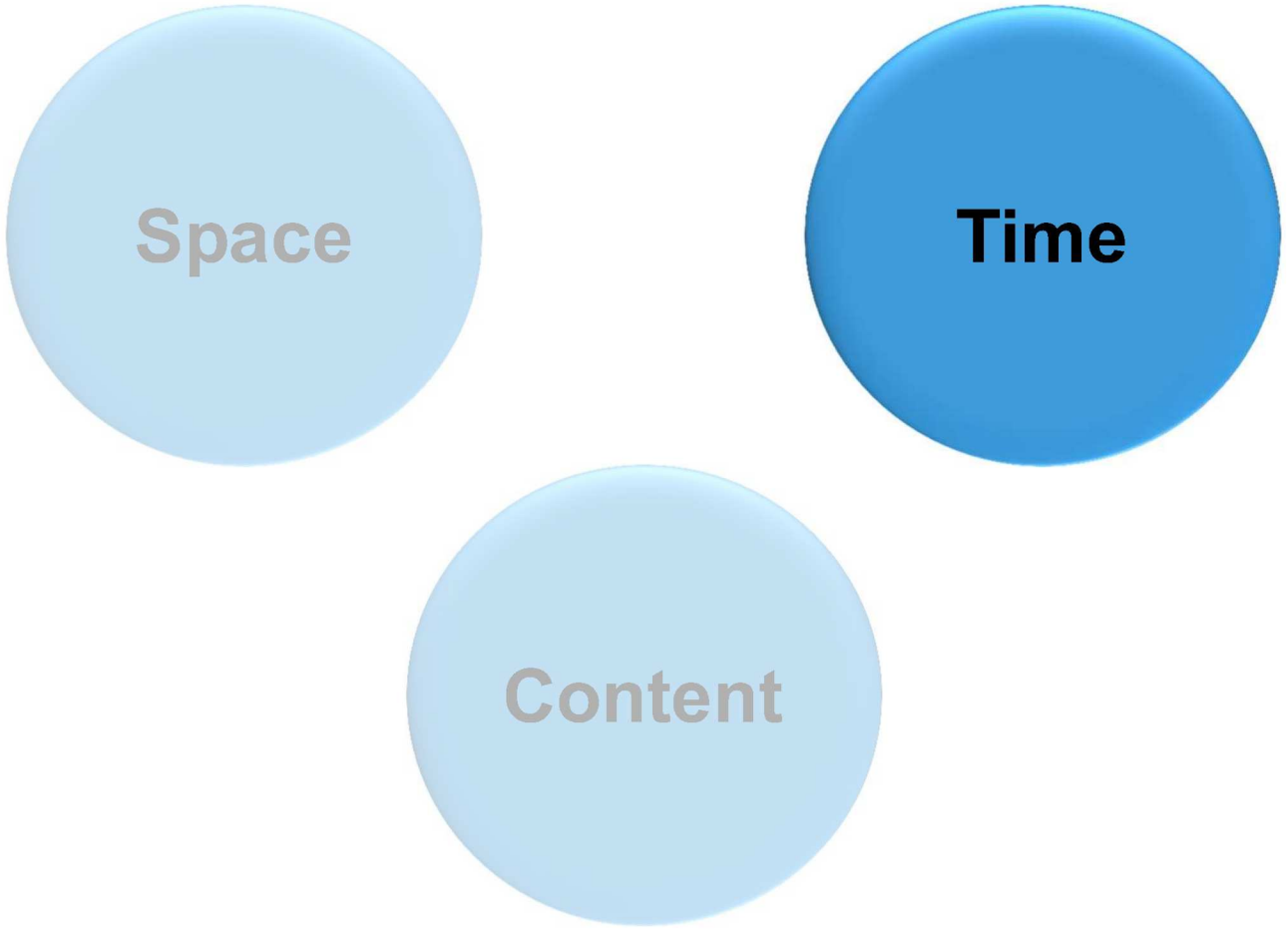
Pointing accuracy using the sun, cont'd







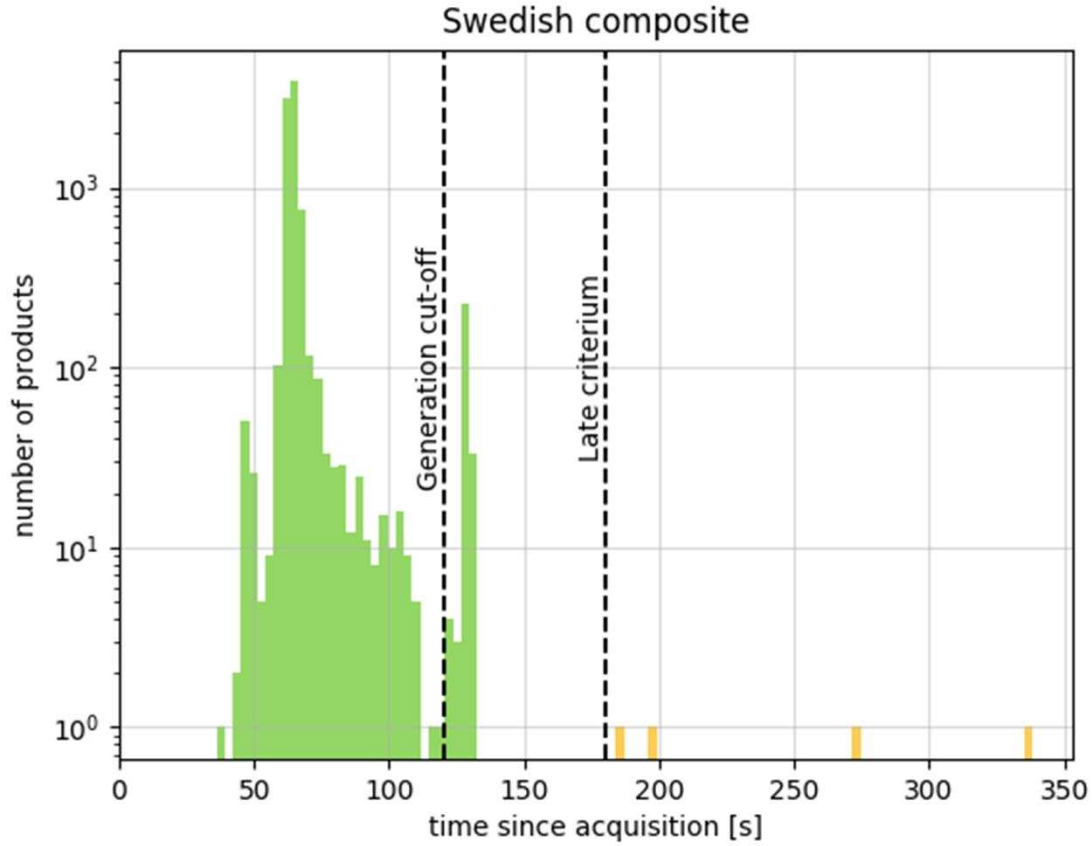
Reliability



Product timeliness – Swedish composites

September 2019

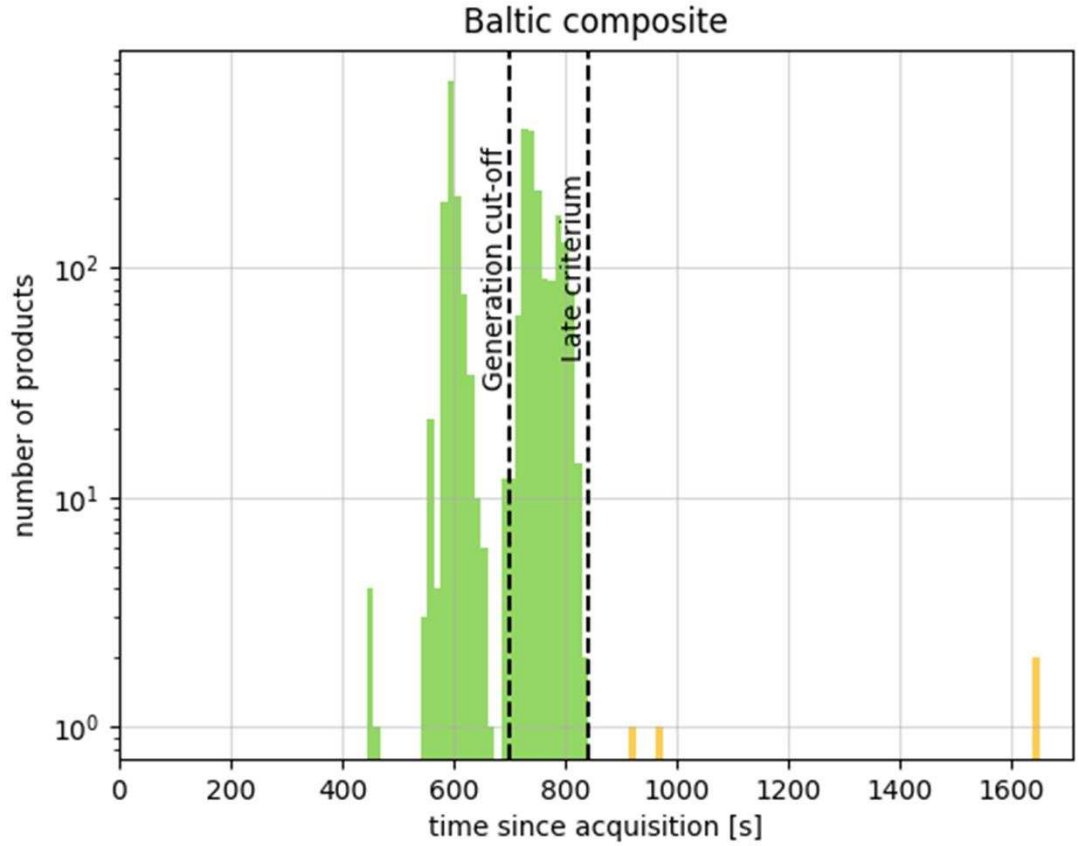
Expected: 8640, Late: 4 (0.05 %), Missing: 1 (0.01 %)



Product timeliness – Baltic composites

September 2019

Expected: 2880, Late: 3 (0.1 %), Missing: 12 (0.4 %)

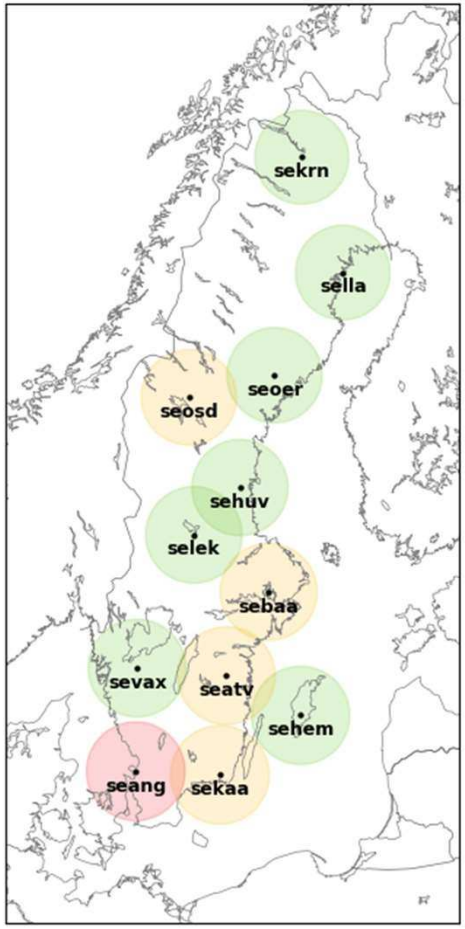


Radar data availability

September 2019

Radar	Loss at site	Network loss
sekir	N/A	1.6 %
sella	0.3 %	0.0 %
seoer	0.7 %	0.0 %
seosd	1.1 %	2.8 %
sehuv	0.3 %	0.0 %
selek	0.4 %	0.0 %
sebaa	1.4 %	0.0 %
sevax	0.2 %	49 %
seatv	1.1 %	0.0 %
sehem	0.3 %	0.0 %
seang	53 %	0.0 %
sekaa	1.3 %	0.2 %
All	**5.6 %**	**5.1 %**

seang: The losses at site due to maintenance and retrofit
sevax: Long continuous period of communication failure



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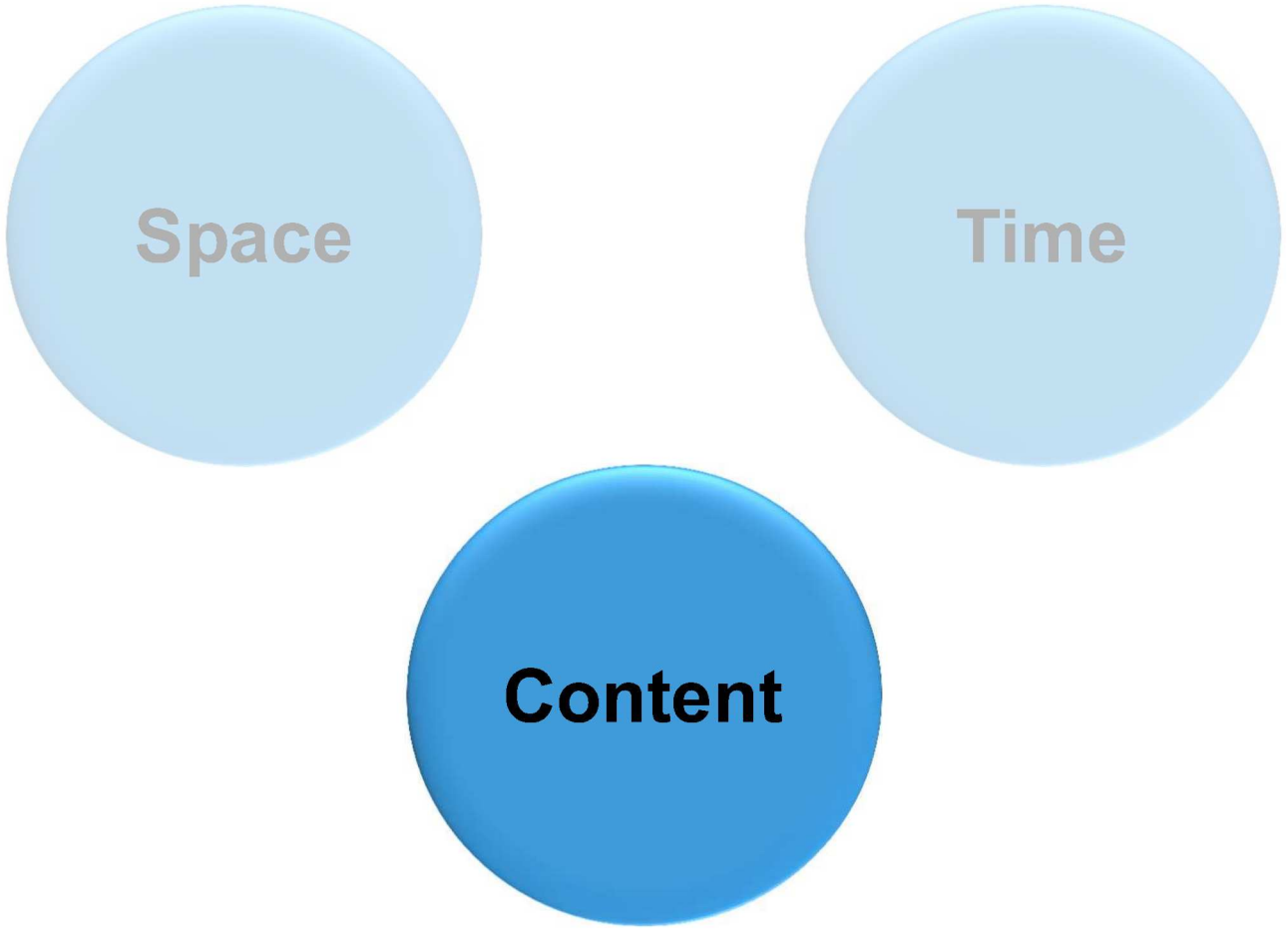
Product availability

September 2019

Product type	Expected	Missing	Availability
Polar volumes	336960	28324	91.6 %
SE single-site products	201600	19700	90.2 %
Composites	17280	38	99.8 %
Rain-rate products	750	4	99.5 %
TOTAL	**556590**	**48066**	**91.4 %**

Reliability



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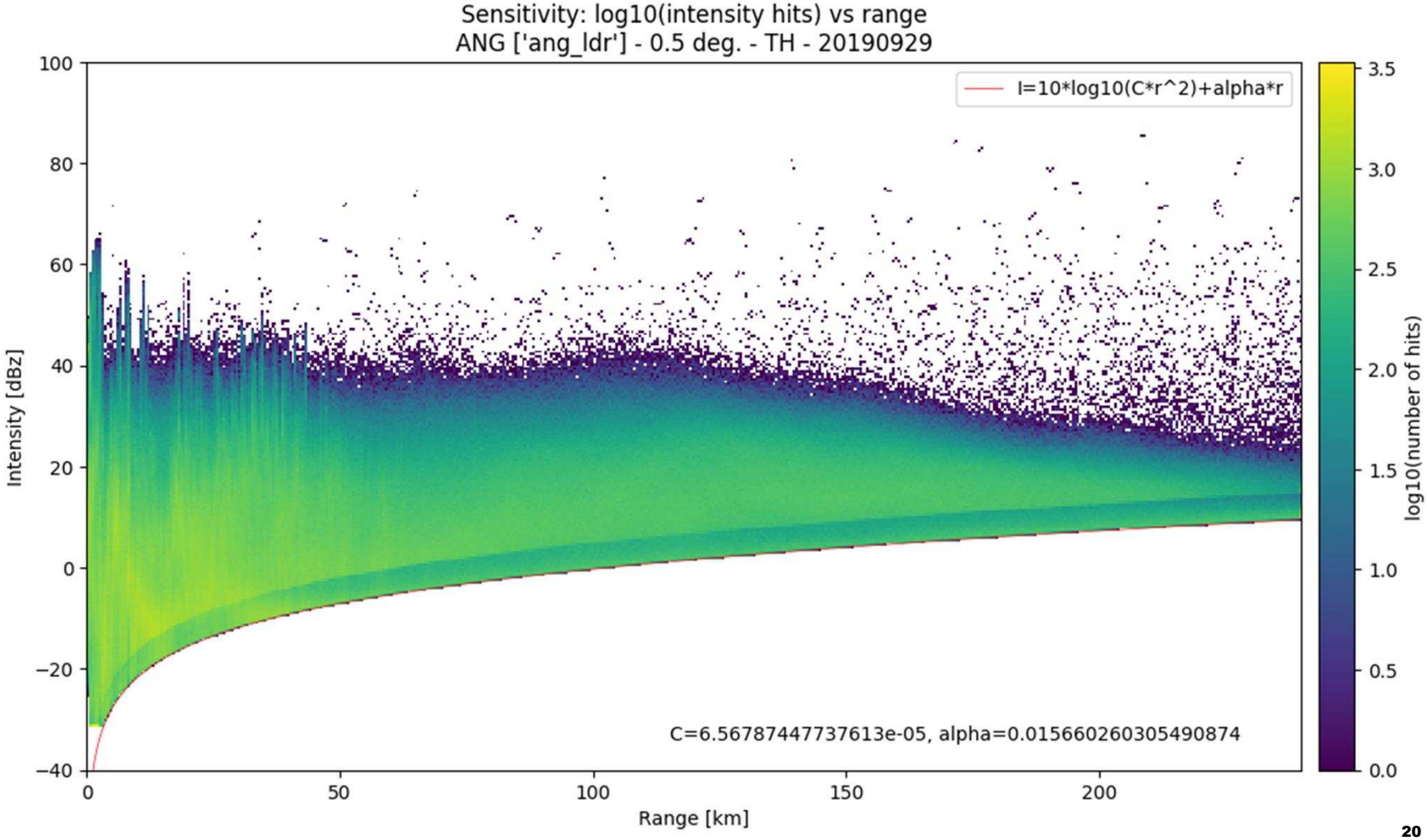
Sensitivity
– or lowest detected intensity



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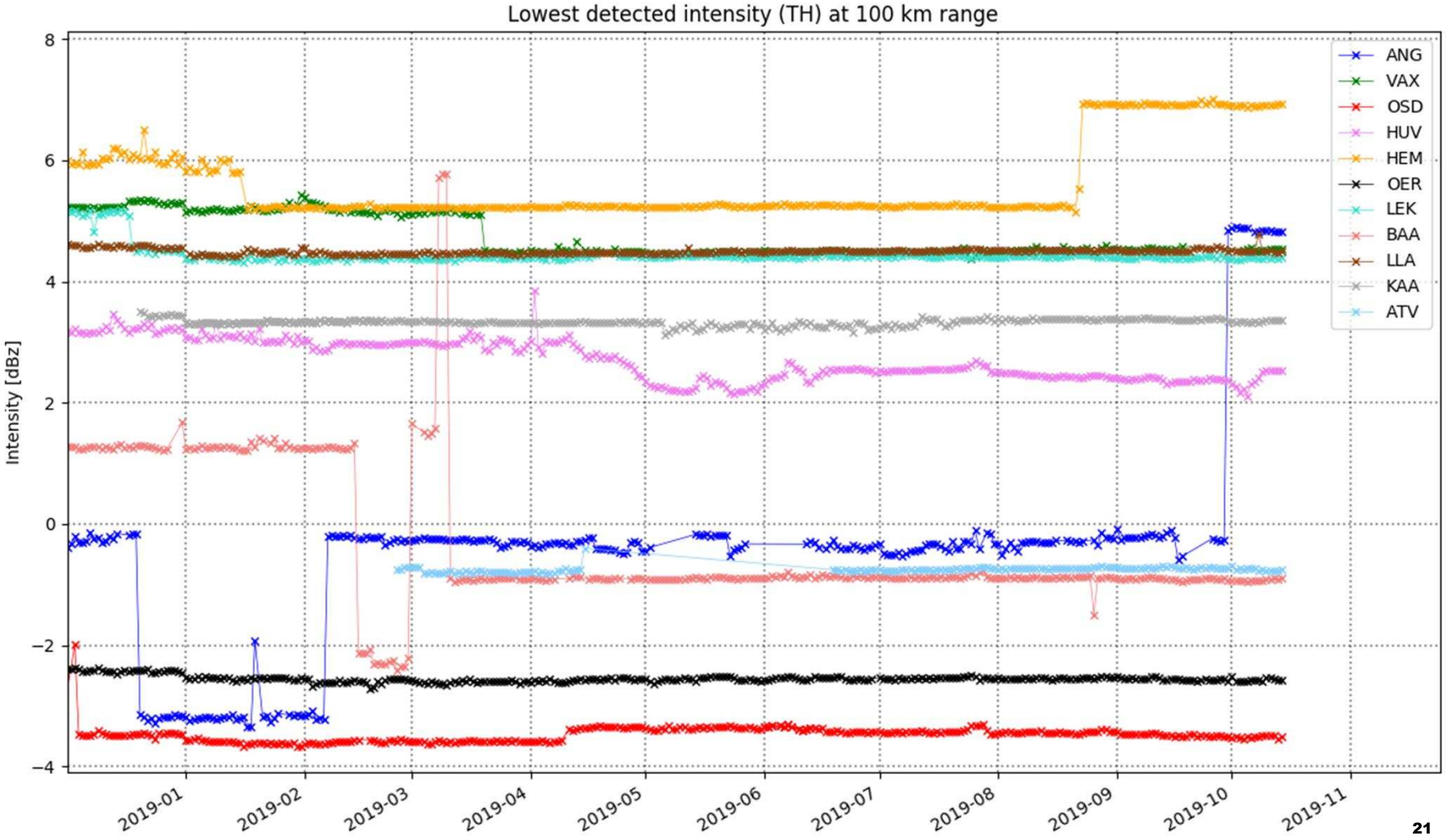
Sensitivity
– or lowest detected intensity, cont'd



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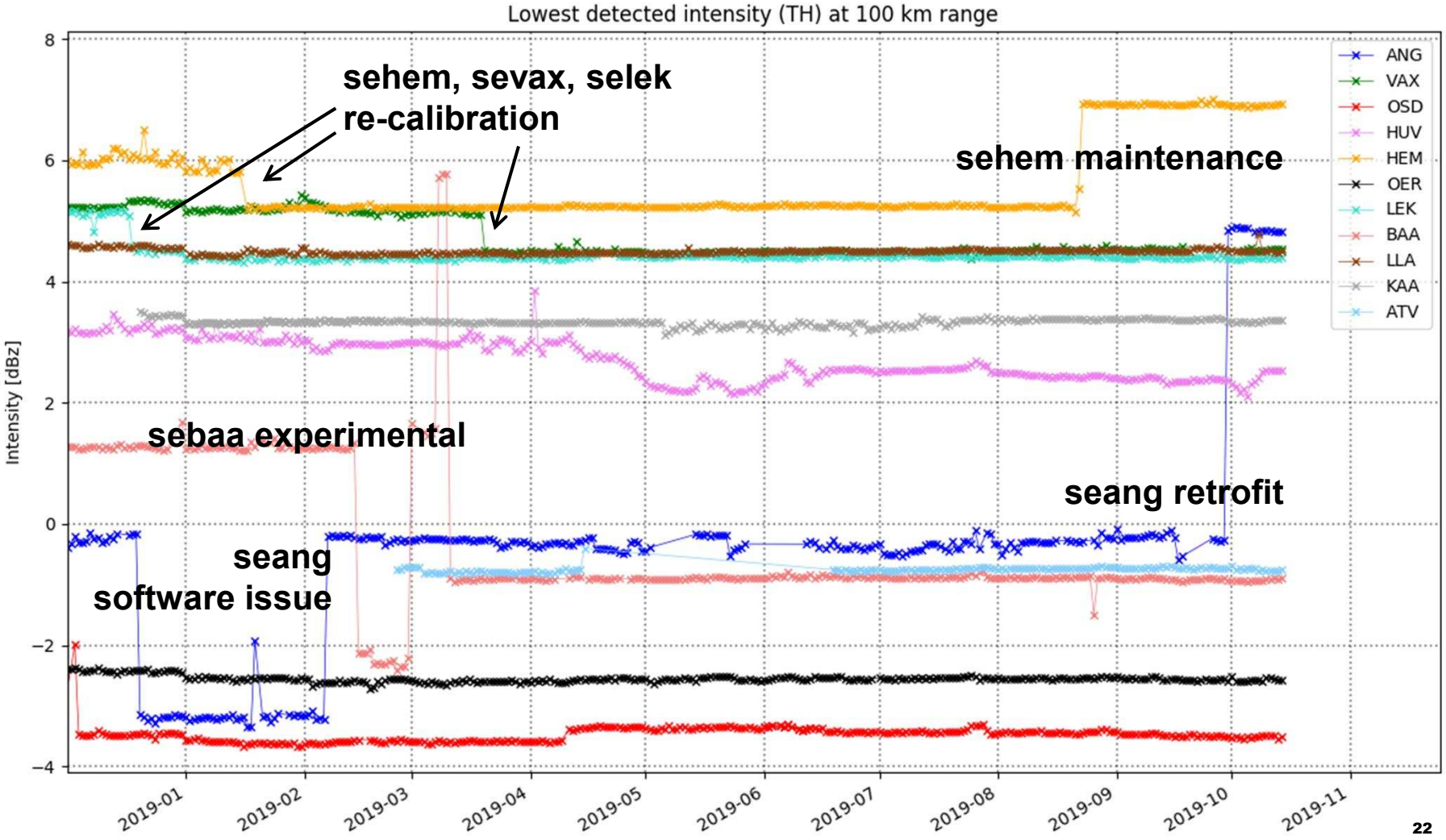
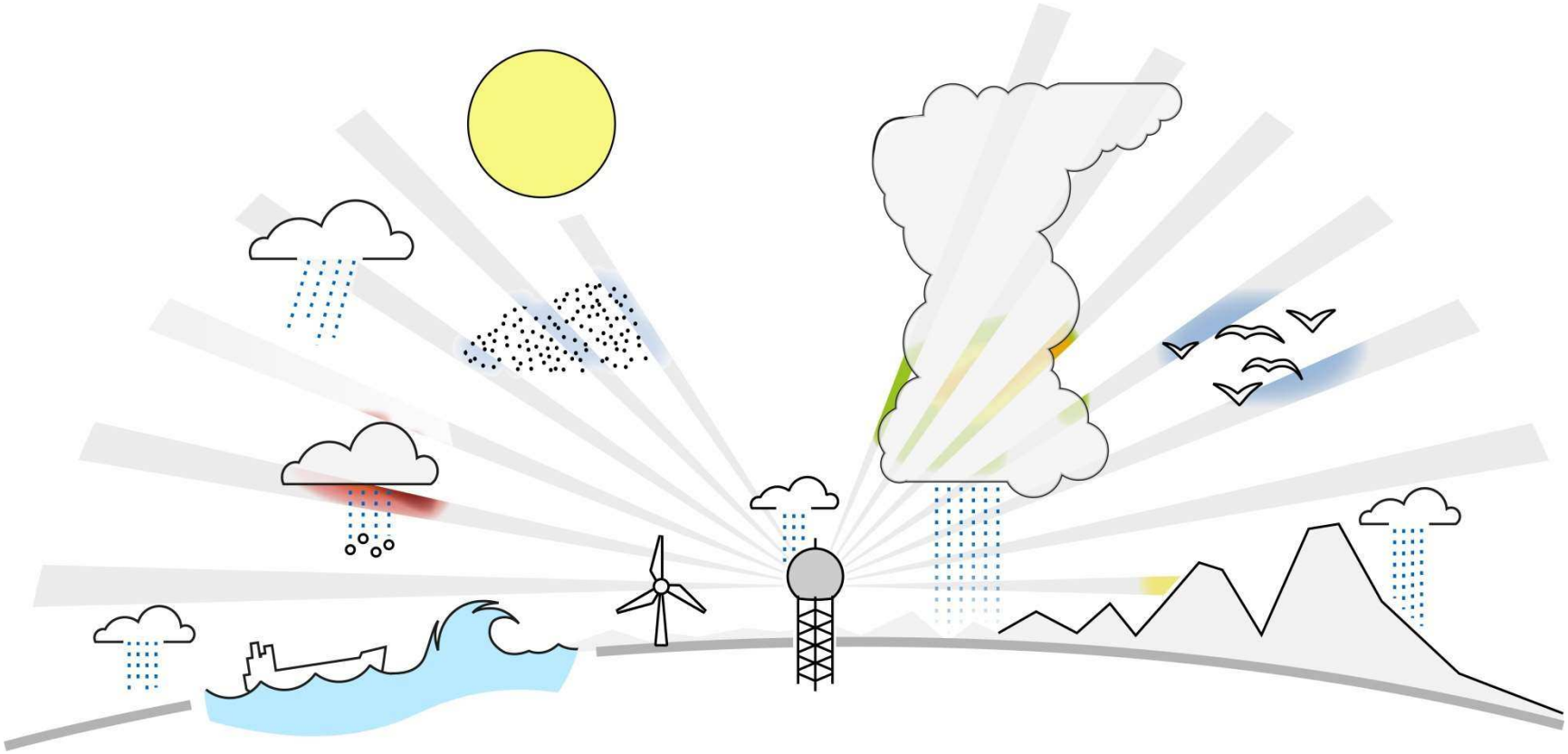
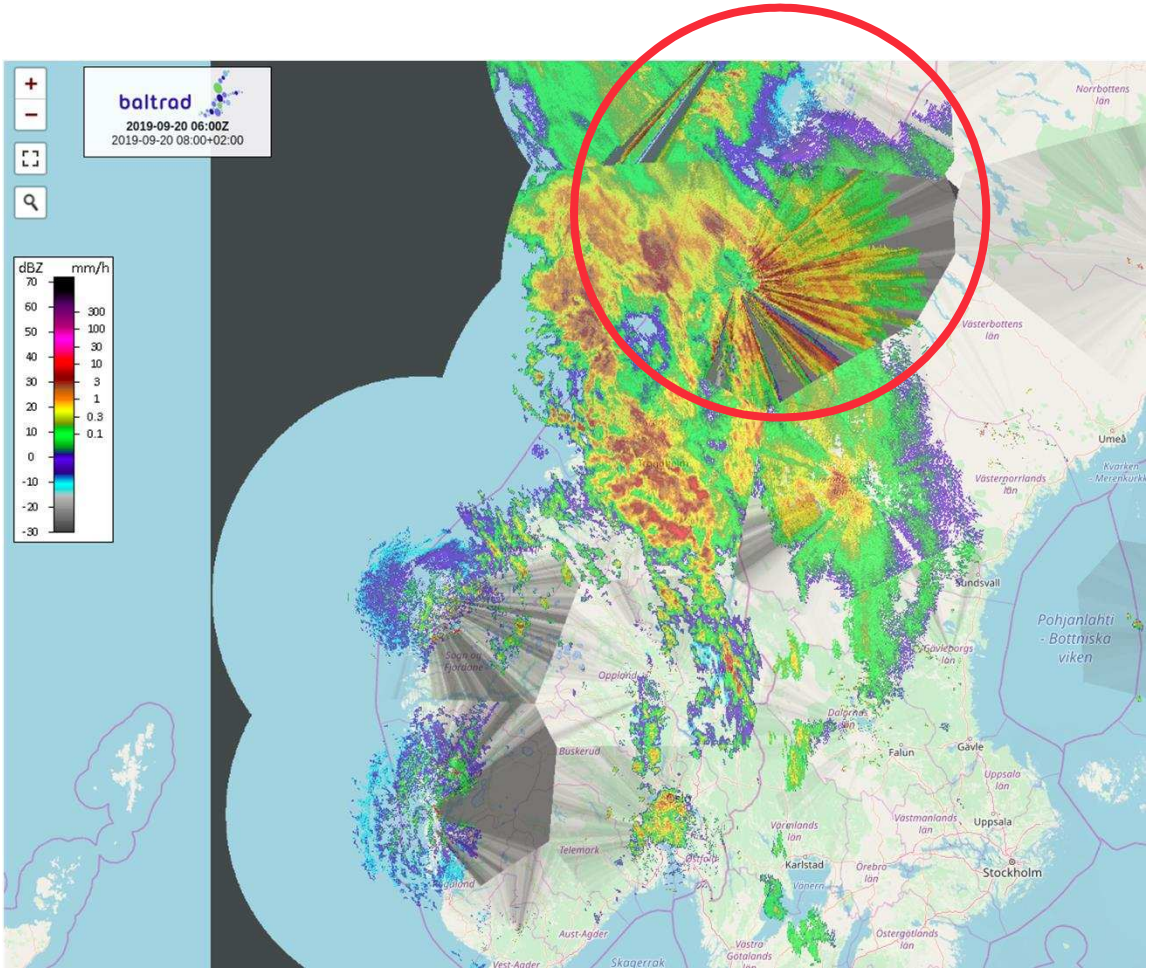
Sensitivity
– or lowest detected intensity, cont'd



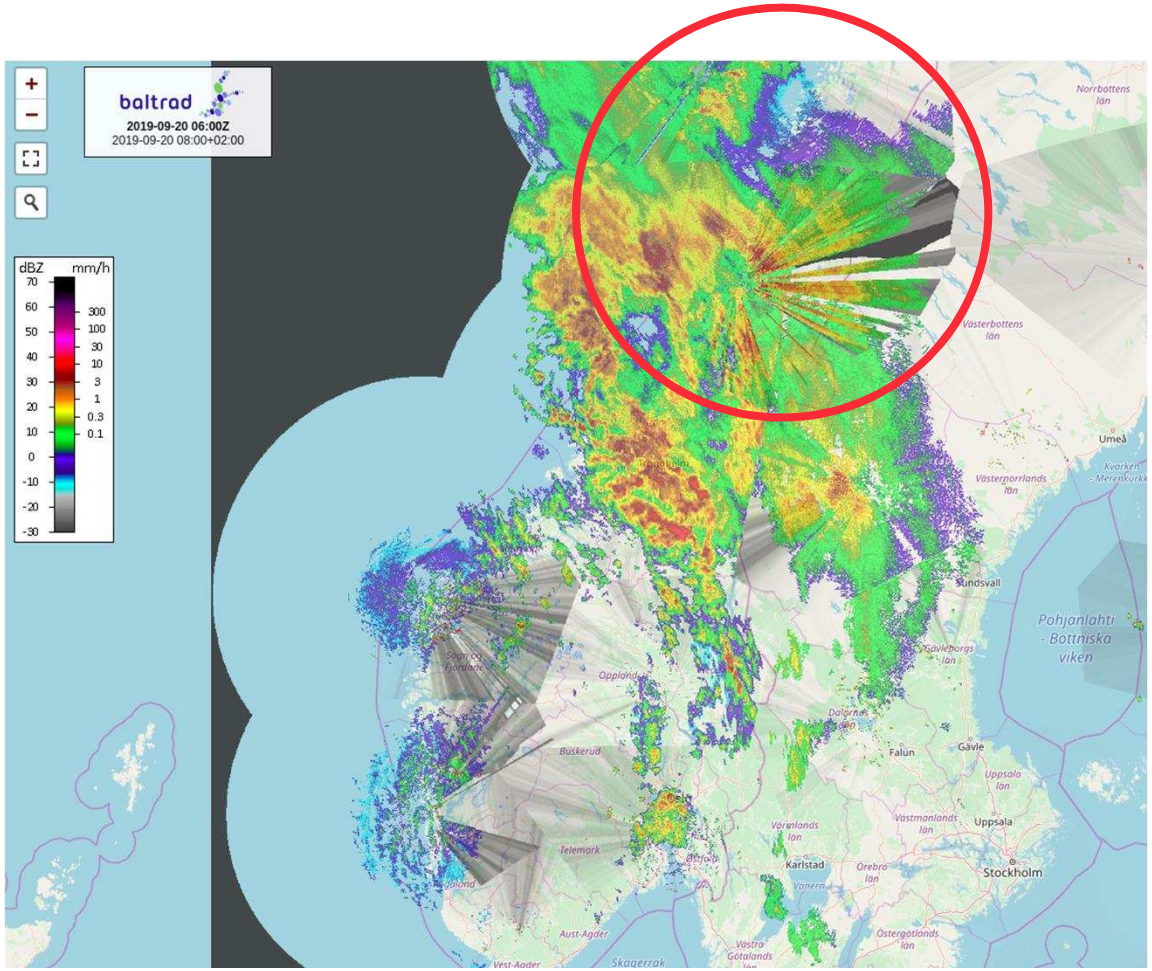
Impact on data quality



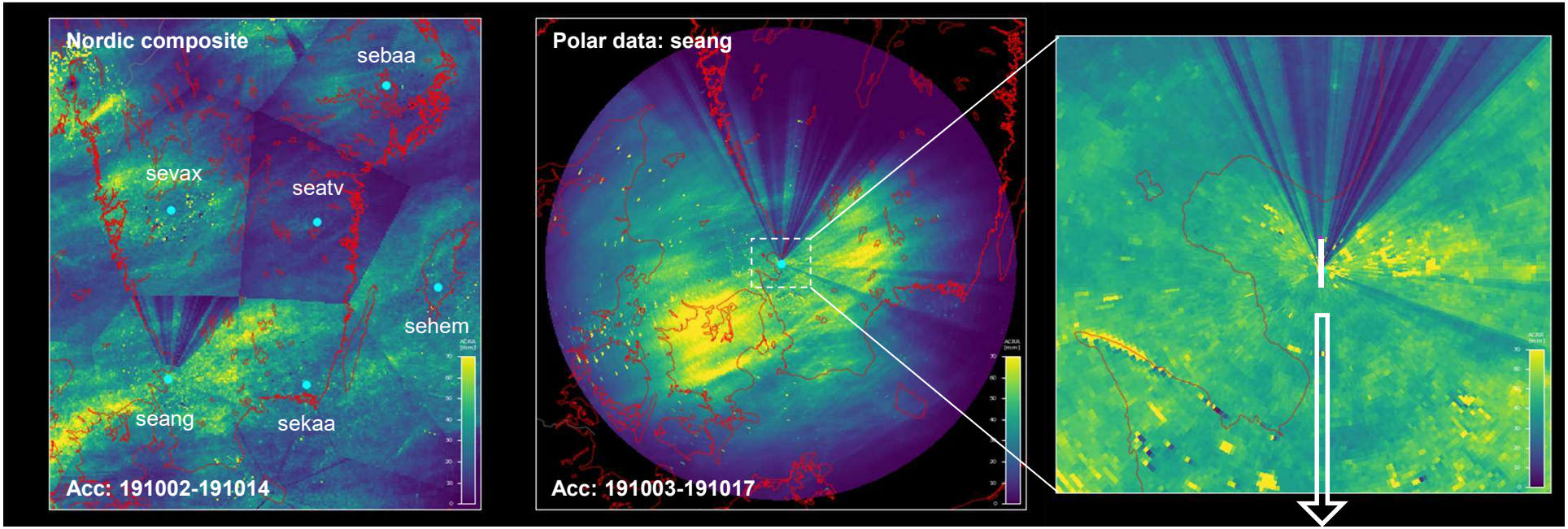
Terrain blockage correction



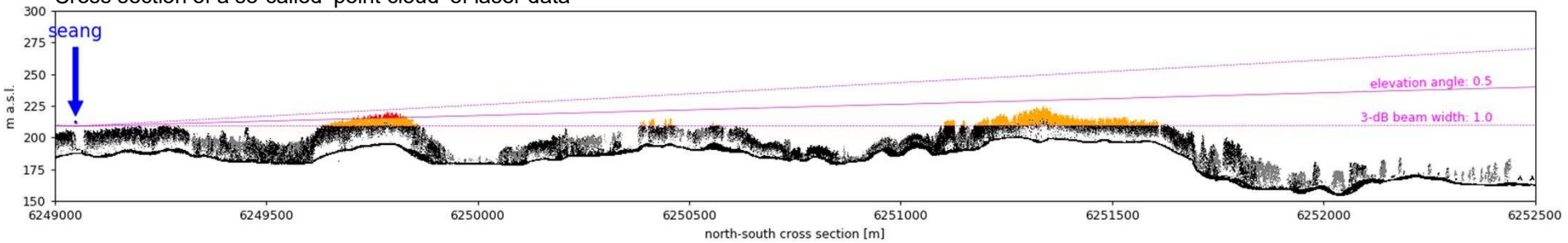
Terrain blockage correction



Vegetation blockage



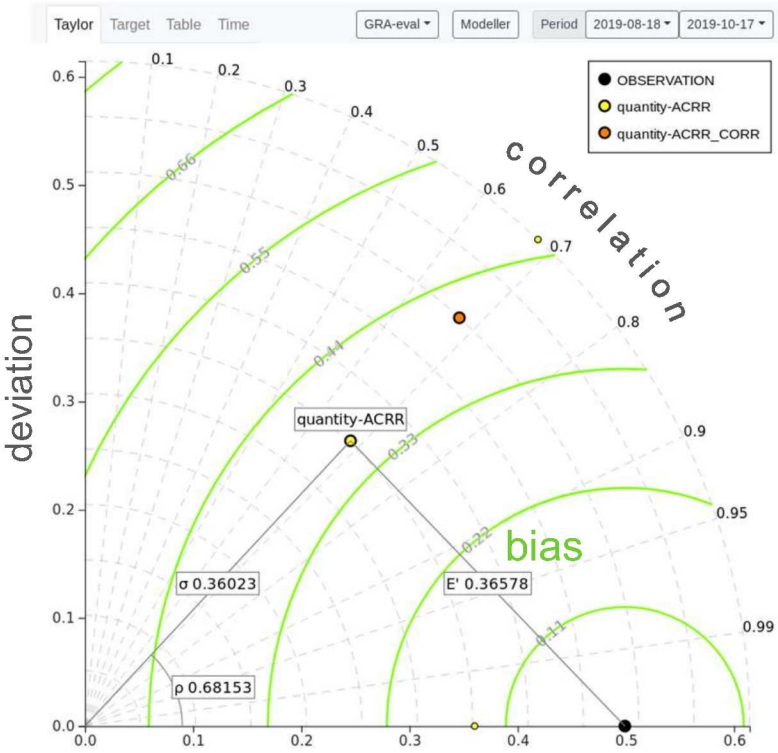
Cross section of a so-called 'point cloud' of laser data



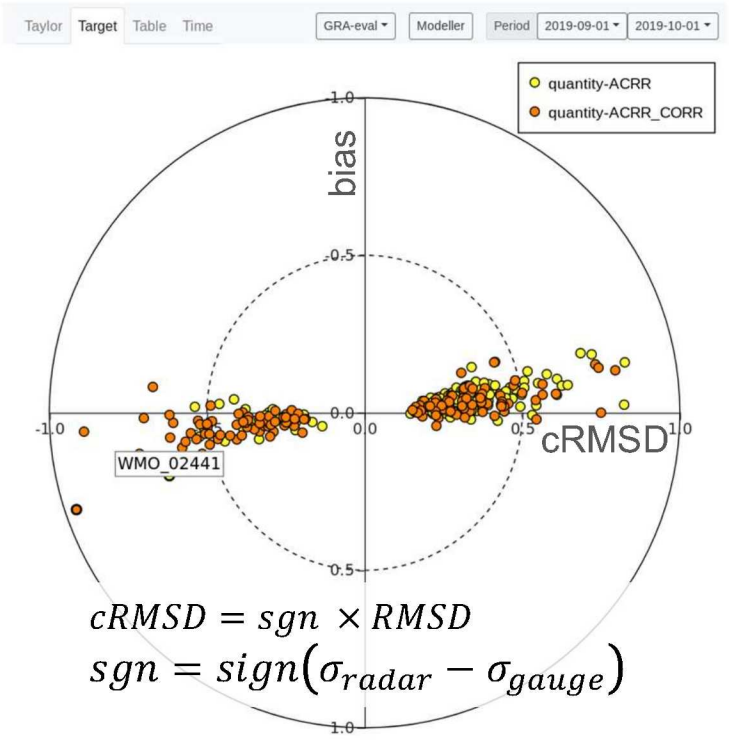
Laser data from Lantmäteriet, April 2019

Correction methods

Impact of Gauge-Radar Adjustment (GRA)



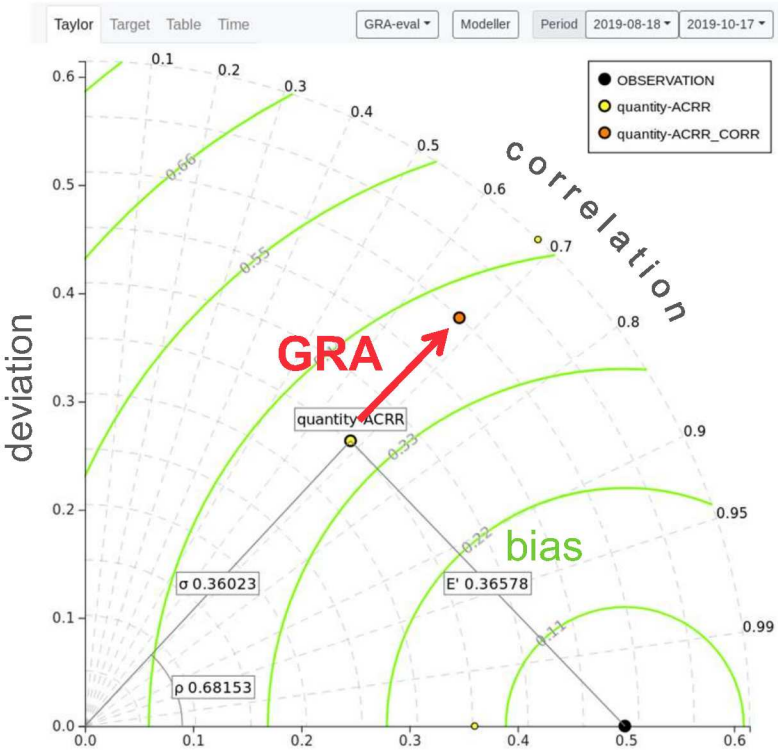
Taylor diagram



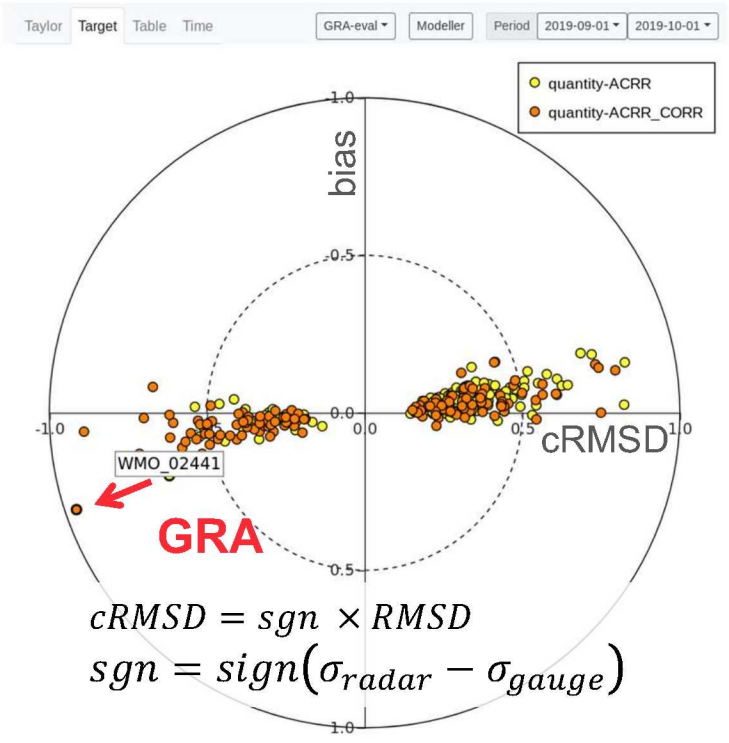
Target diagram

Correction methods

Impact of Gauge-Radar Adjustment (GRA)



Taylor diagram



Target diagram

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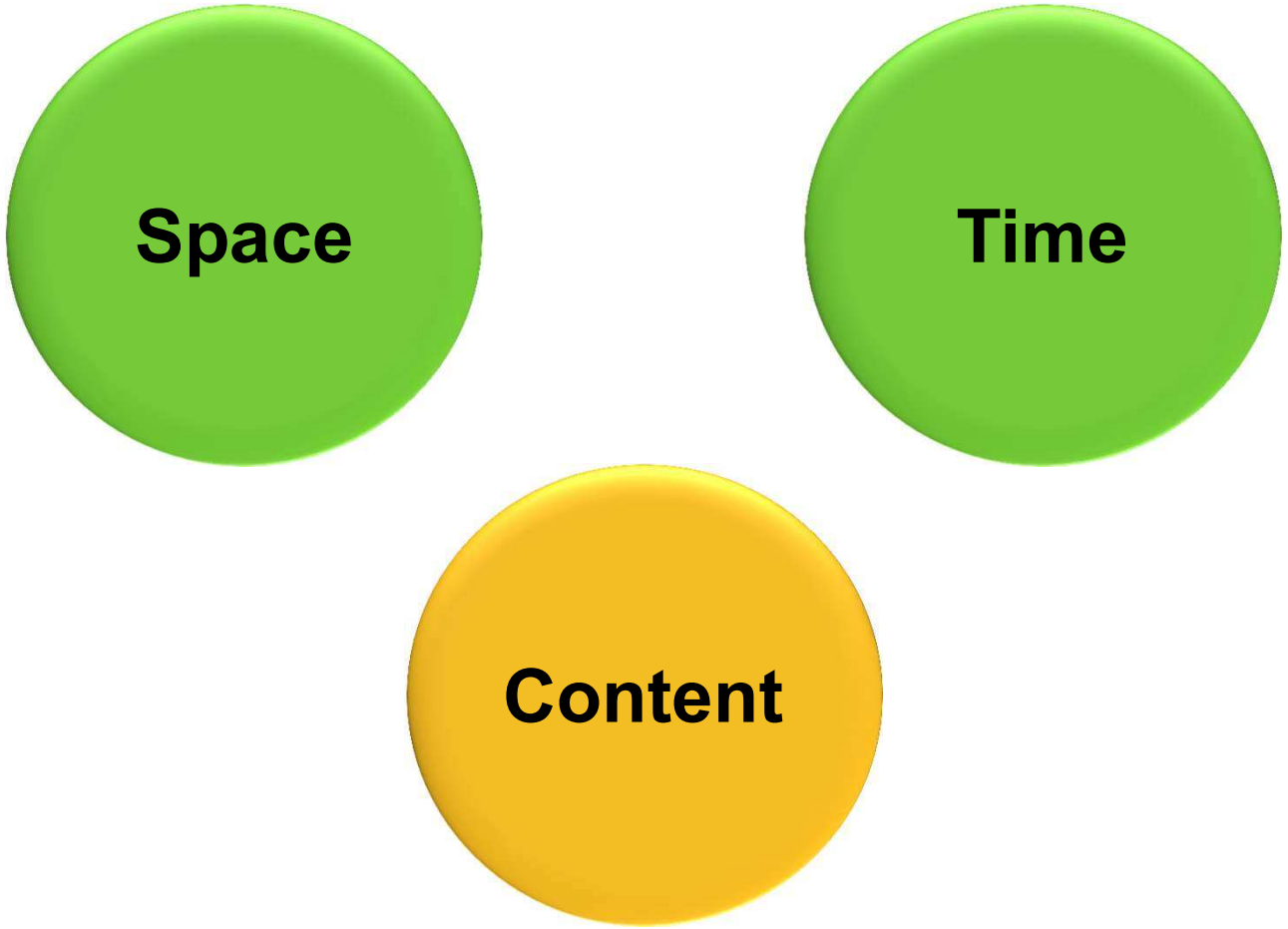
Reliability



Kontakt

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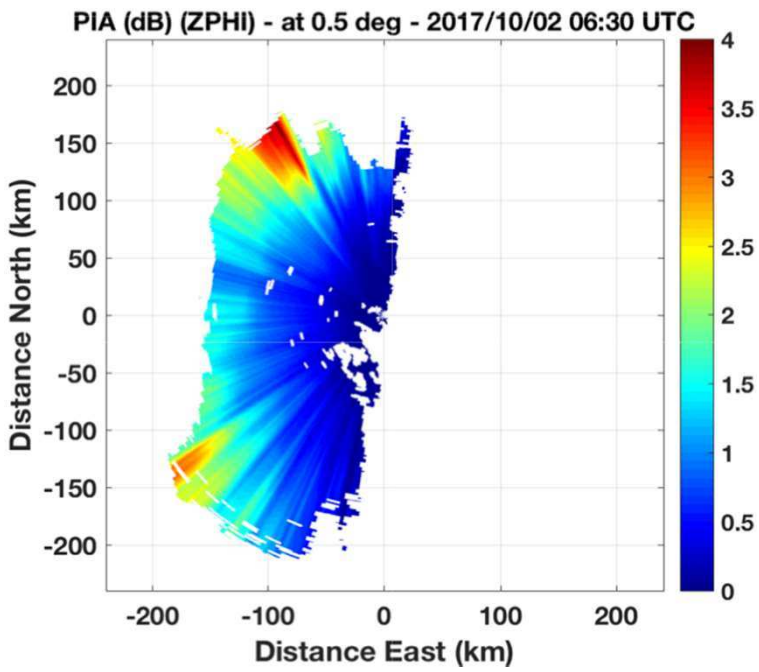
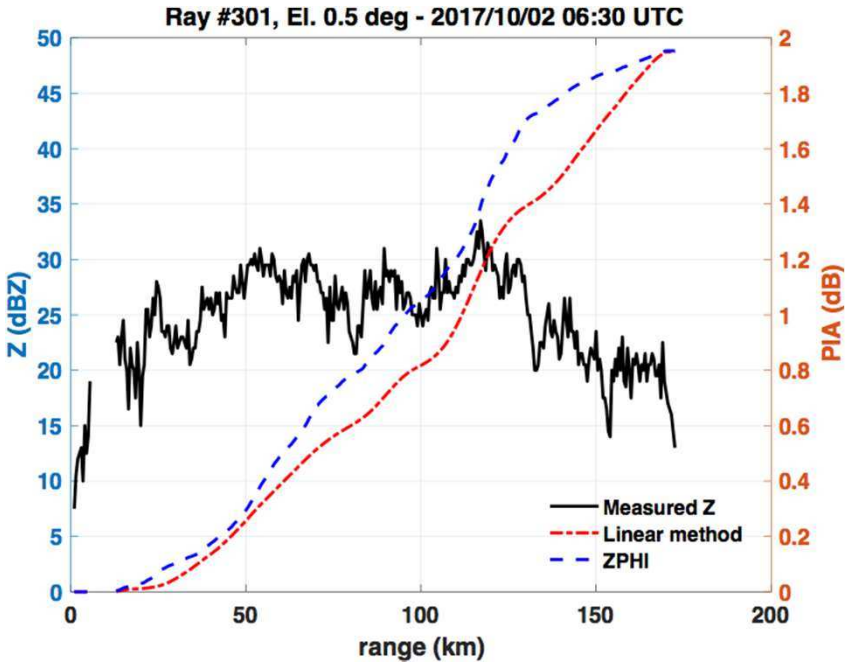
Swerad förvaltning: swerad-teknik@smhi.se

Attenuation correction





Path Integrated Attenuation (ZPHI method)

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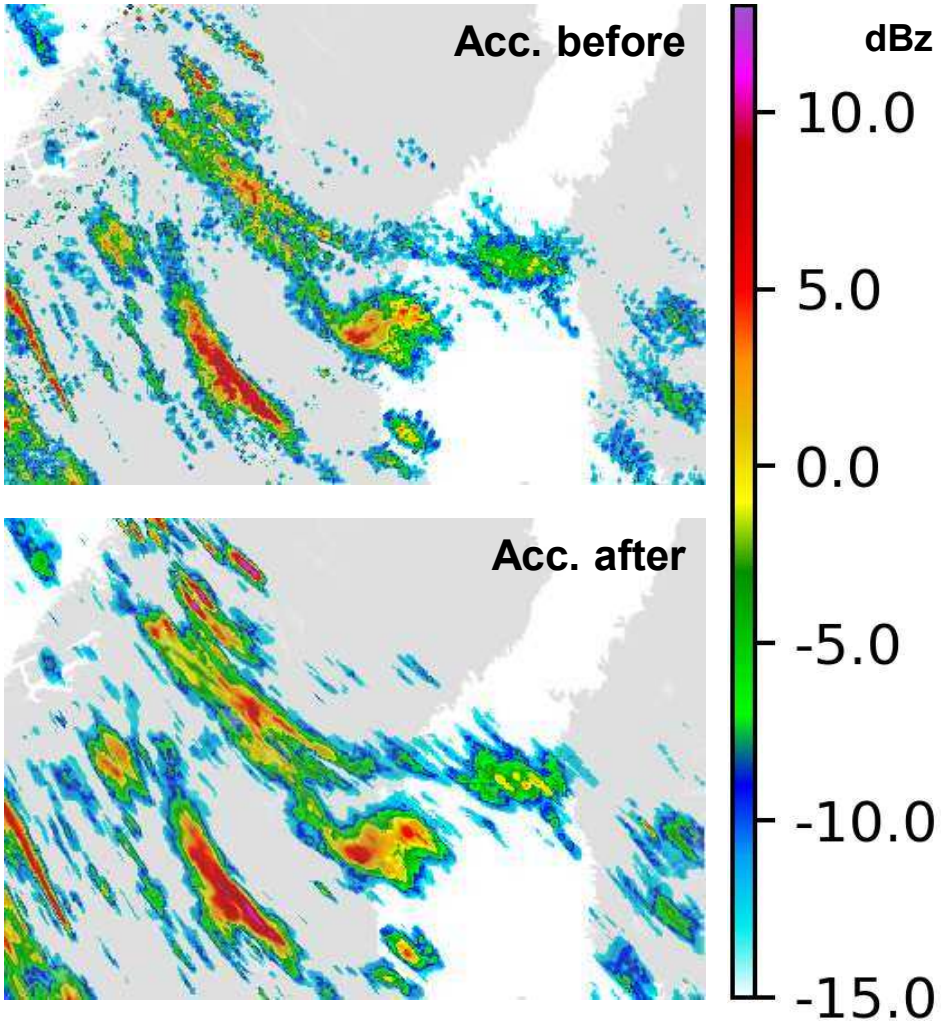
Advection smoothing



Implementation of pySTEPS in HIPRADv3.

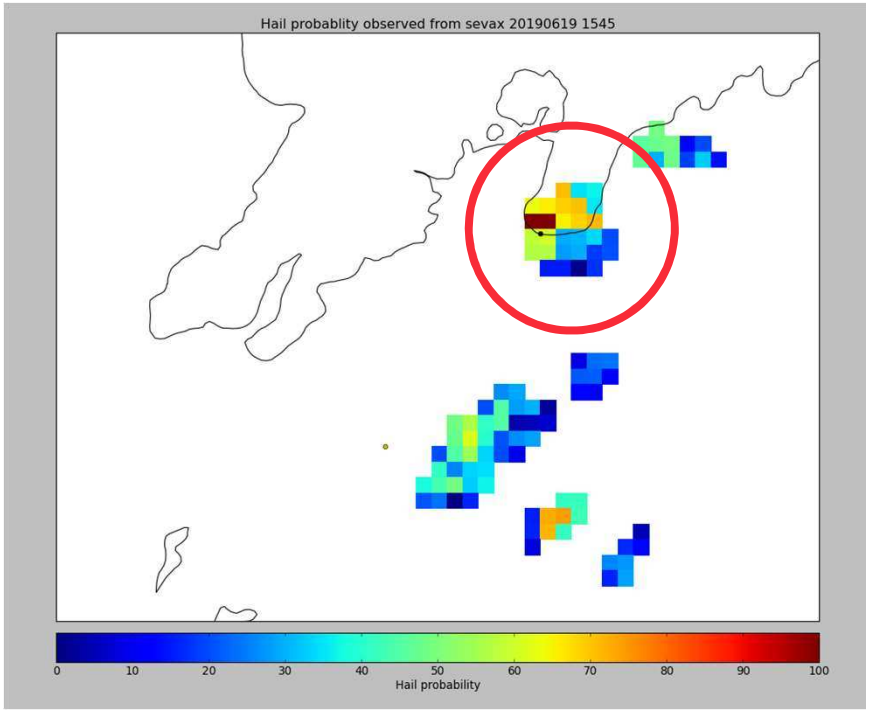
Smoothing is performed prior correction to other observations.

Operational in HIPRAD, beginning of 2020.

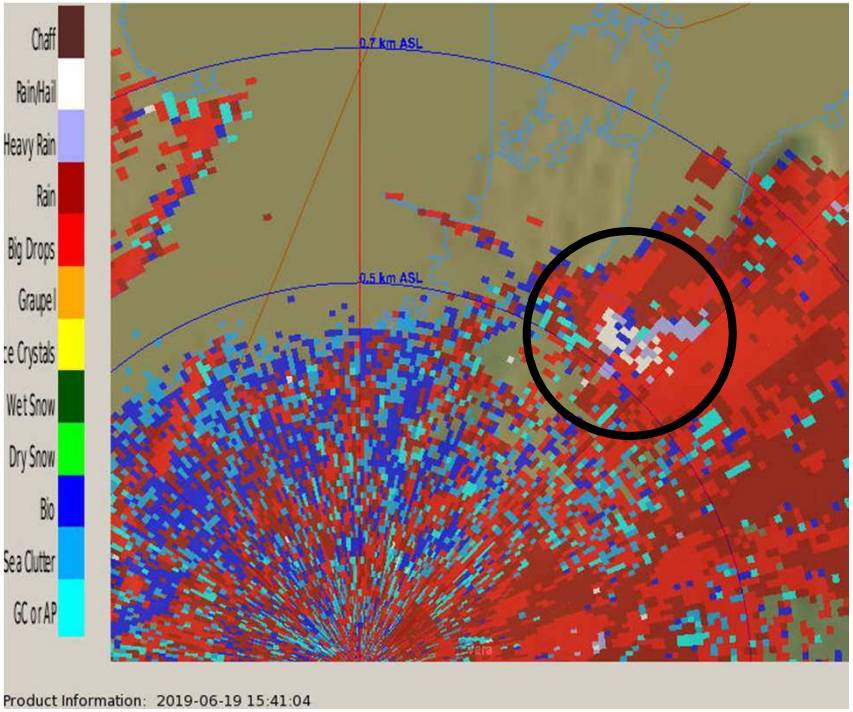
To be implemented in Baltrad.

Work by (SMHI):
Remco van de Beek
Riejanne Mook
Denica Bozhinova,
Peter Berg

Probability of hail



Holleman (2001)



HMC (EDGE)

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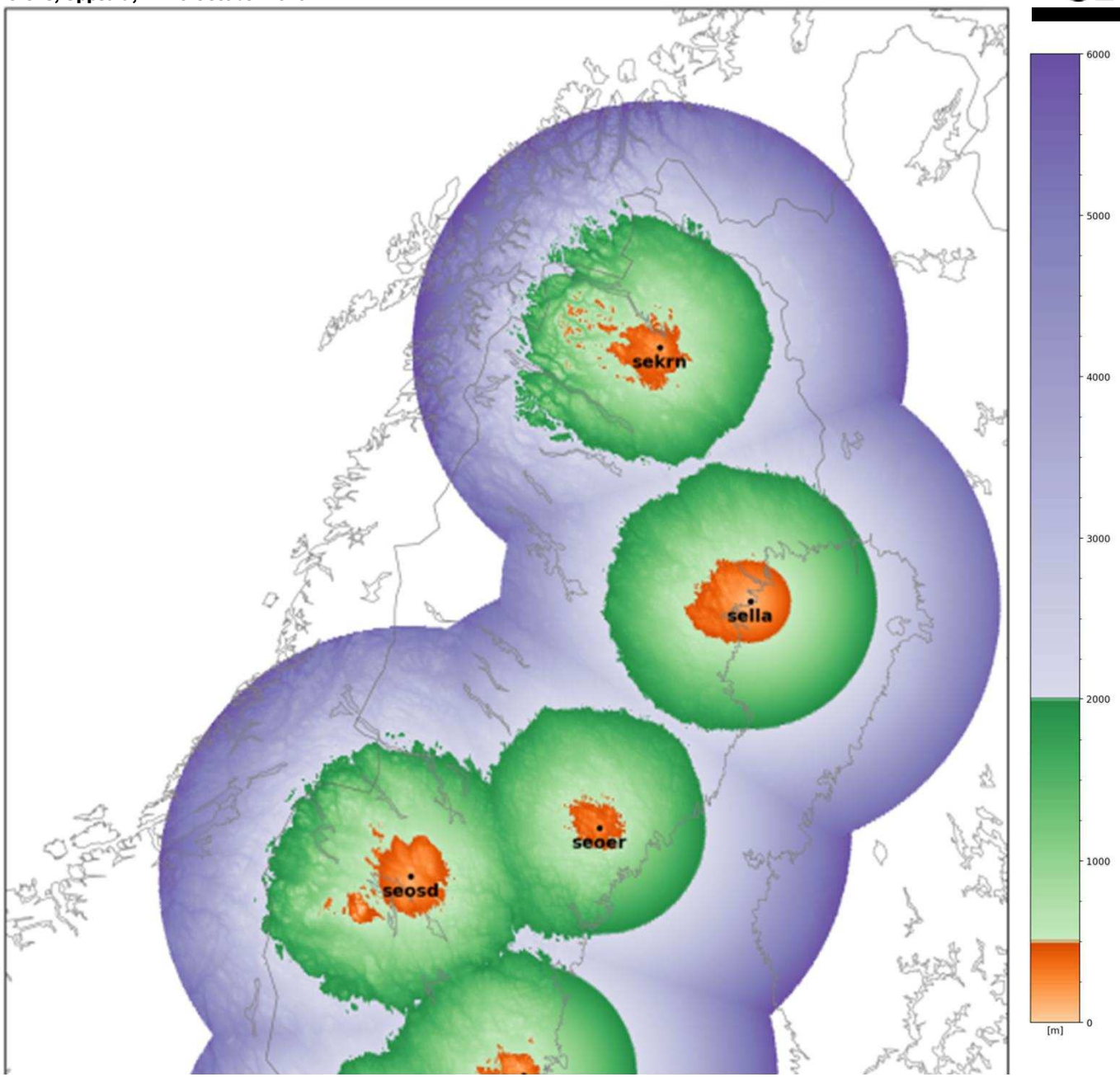
Coverage map – North Sweden



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Coverage map – South Sweden